CONCLUSION

CAS is as technically feasible, safe, and durable in anatomically high-risk patients as in medically high-risk patients, with similar rates of periprocedural stroke, death, and late restenosis. However, patients with radiation-induced stenosis appear to be at an increased risk for restenosis.

AUTHOR CONTRIBUTIONS

Conception and design: SS, JP, AR
Analysis and interpretation: SS, JP
Data collection: SS, AR, CS
Writing the article: SS, JP
Critical revision of the article: SS, JP
Final approval of the article: SS, JP
Statistical analysis: SS, CS
Obtained funding: JP, RD, RS
Overall responsibility: JP

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DISCUSSION

Dr Peter Lin (*Houston, Tex*). Dr Shin and her colleagues from the Eastern Virginia Medical School should be congratulated for an excellent clinical study in which they analyzed the clinical outcome of carotid stenting in patients who have high-risk medical comorbidities vs those with anatomically high-risk lesions. The authors reported similar clinical outcome in terms of stroke and mortality between the two groups. However, patients with radiation-induced stenosis had a much higher risk of restenosis compared to the medically high-risk cohorts. I have three questions for the author.

My first question relates to the ultrasound surveillance. The higher risks of restenosis in patients with radiation-induced carotid lesions, in my view, warrants a more vigilant or frequent ultrasound surveillance protocol since the need for reintervention is undoubtedly higher. Can you share with us your view whether a more vigilant surveillance protocol is necessary in this particular patient cohort? If so, what should be the ideal surveillance protocol in these patients?

Second, in your study, a variety of carotid stents including the Smart, Precise, and Acculink stents were used. There have been studies in the recent literature to suggest these nitinol stents, which are considered a open-cell stent, have lower patency compared to closed-cell stents such as Wallstent. This is a finding that we have also validated in our own clinical experience. This finding has also

led some researchers to advocate the notion that different carotid stent should be applied based on patients' anatomical factors. Can you share with us with your opinion regarding the notion that different devices (ie, open- vs closed-cell stent) should be applied to different patient cohorts based on the higher risk of restenosis?

My last question has to do with the ultrasound criteria which you based to determine the degree of restenosis. In our practice, we have found the velocity criteria used to determine carotid stenting-related restenosis varies based on the stent used. In other words, we have noted that the same velocity criteria used for a nitinol stent does not apply to the Wallstent. We also learned that same velocity criteria for de novo carotid lesion do not apply to lesion of carotid stent-related restenosis. How did you derive your velocity criteria in your study? Have your found a difference in velocity criteria based on the stents used in your study?

I'd like to thank the authors for providing me with a well-written manuscript well ahead of time. I'd also want to thank the association for the opportunity to discuss this paper.

Dr Susanna H. Shin. Thank you for your comments and your questions. Your first question is on the surveillance of our patients. Routinely, our patients undergo a duplex ultrasound within 24 hours of their procedure, then at 1 month and 6 months, and annually thereafter. In our study, we had patients in the radiation cohort who developed restenosis at 7.5 months, 9.1 months, 13 months, and at 58 months. Currently, we do not have a different protocol for following up these patients more often, perhaps that would lead us to detecting restenoses earlier and potentially provide for them to have reintervention sooner.

Your second question was based on the type of stent. The majority of our patients were part of a trial. Obviously, the stent choice was predetermined, and therefore dictated by that trial and the majority of our patients received open-cell stents. Future directions would be potentially to use closed-cell stents, which might be better in this specific cohort of radiation-induced stenosis, and perhaps another option would be using drug-eluting stents or covered stents.

For stenosis criteria, we don't use, at this time, different velocity criteria for different stents. We currently use the established criteria set forth by Dr AbuRhama and currently we are looking at our own duplex velocity data and comparing them to our angiograms to see how they correlate and potentially come up with new criteria for those stents.